

A background image showing a water splash with concentric ripples on a light blue surface. The text 'Natural Resources' is overlaid on this image.

Natural Resources

THE WORM SHALL SQUIRM

Grades: K-3

Subjects: Science, Writing

Montana Standards: Science 1, Writing 1

Approximate Time: 20 minutes, plus time 3 days later

Objectives: Students will

- Learn about cycles in nature
- Observe earthworms and learn how they are beneficial to our environment.
- Identify and describe characteristics of earthworms.

Materials Needed:

- “The Outside of a Worm” handout
- Two jars
- Lids with holes
- Dark soil
- Sandy soil (bright color)
- Two earthworms
- Carrot scraps
- Dark paper (two pieces)
- Masking tape
- Water

Keywords:

Recyclers, burrows, castings

Brief Description:

Earthworms live in warm, moist soil throughout the world. Earthworms can be found in many different sizes. The smallest earthworm can be only one millimeter long and the longest can be 11 feet long!

Earthworms are great recyclers because they take food scraps and other decaying matter in the soil and turn it into nutrients for plants. As the worm digs, it eats. The earthworm eats dead plants and animals, soil, sand and even small pebbles. An earthworm eats as much as it weighs each day. At night a type of earthworm called a night crawler will tunnel above ground and leave its droppings. These droppings are called castings.

An earthworm will also break up leaves. After the leaves are in small pieces the worm will drag them into its burrow. It will eat these later.

How do earthworms move? Earthworms have two sets of muscles. They have circular muscles around each segment, and long muscles that run the length of the body. When the circular muscles tighten, the earthworm becomes longer and thinner. When the lengthwise muscles tighten, the earthworm becomes shorter and fatter.

Lesson:

1. Handout and discuss “The Outside of a Worm”.
2. In the bottom of each jar, put a layer of dark soil about one inch thick. On top of this, place a one-inch thick of light sandy soil. Keep adding layers until the jar is half full.
3. Slightly moisten the soil in both jars with water.
4. Place the two earthworms in *one* jar, and then add some carrot scraps to both jars.
5. Put a lid on each jar. Label the jar with earthworms as “Earthworms” and label the other jar “No Earthworms.”
6. Take the dark pieces of paper and wrap around each jar. Tape tightly. Put the jars aside.
7. Have each student write down their predictions about what will happen in each jar.

8. After three days unwrap the jars. See what has happened.

Assessment questions:

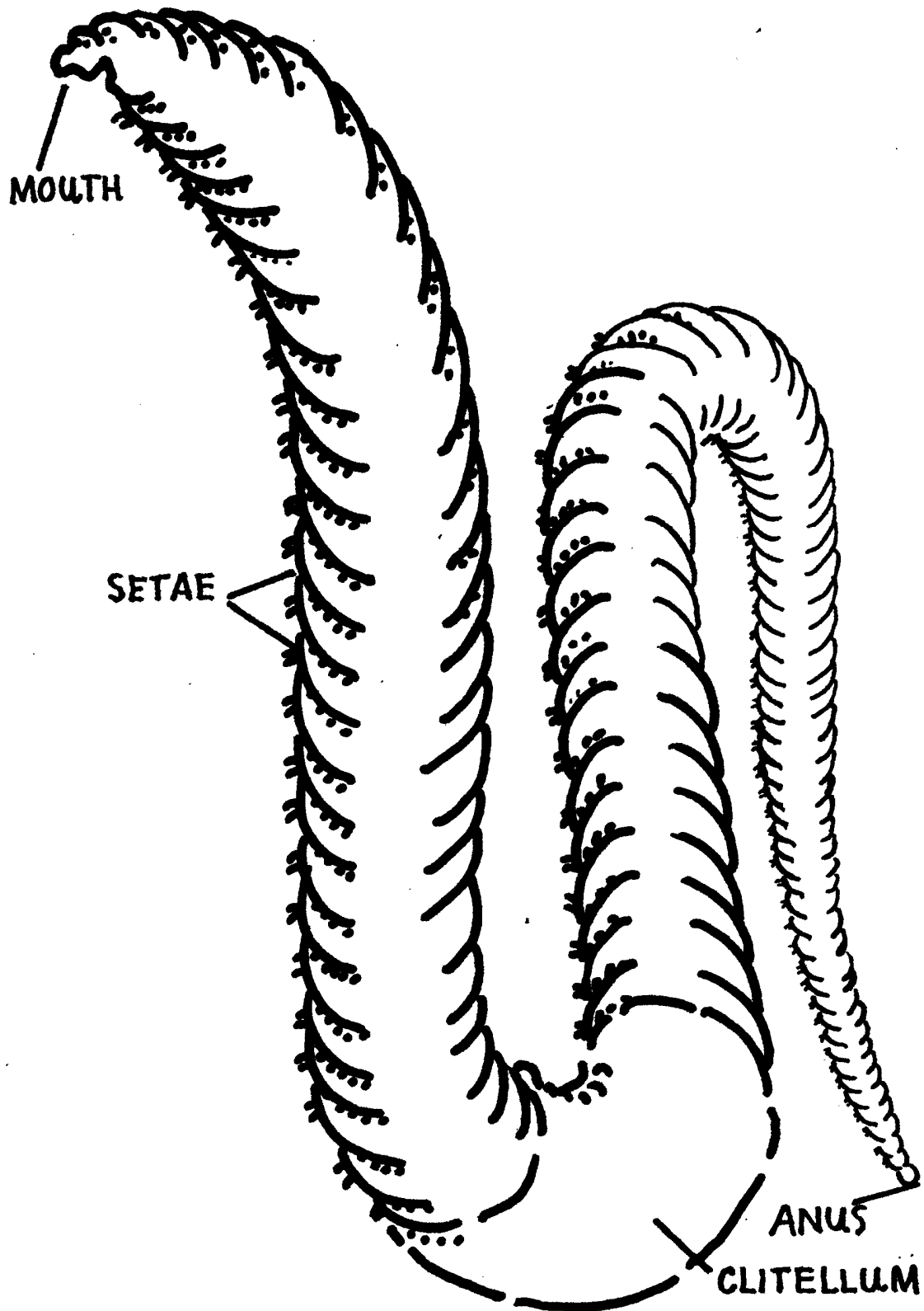
1. Which jar contained the earthworm? Describe the soil in each jar.
2. Which jar do you think is a better place for a plant to grow?
3. What are the four main parts of the worm?

Resources:

The Big Green Worm Farm (AMS Treasure Chest)

Mini Worm Farm Instruction Booklet (AMS Treasure Chest)

THE OUTSIDE OF A WORM



SOIL

A DIRTY SUBJECT

Grades: K-3

Subjects: Science, Math, and Language Arts
Montana Standards: Science 1, Math 5, and
Literature 1

Approximate Time: 2- 45 minute classes and 2
weeks for graph

Objectives: Students will

- Become aware of soil and its importance to plants and animals.
- Know the three layers of soil.
- Become aware of which types of soil are best for growing plants.
- Measure and graph seed growth.

Materials Needed:

- A Handful of Dirt by Raymond Bial
- “Rabbit Maze” handout
- “What Is Soil” handout
- Clay
- Sand
- Potting Soil
- Clear plastic cups for planting
- Cups for edible soil
- Bean seeds
- Measuring spoons
- Water
- Large bowls for mixing pudding and crushing cookies
- 1 large package chocolate crème sandwich cookies
- $\frac{3}{4}$ package gummi worms
- 1 package miniature chocolate chips
- 4 tablespoons margarine
- 1 8-oz. package cream cheese
- 1 cup powdered sugar
- 3 $\frac{1}{2}$ cups milk
- 2 3-oz. packages vanilla instant pudding
- 12 oz. container of whipped cream

Keywords:

Bedrock, subsoil, topsoil,
nutrients, organic products,
graph

Brief Description:

Read A Handful of Dirt by Raymond Bial

One of the most important natural resources on earth is soil. Many living things depend on soil either directly or indirectly for a food source. The amount of food-producing land dwindles as the world’s population continues to grow. Farmers have to produce as much food as possible on every foot available. In order for farmers to be productive, they need to have good, nutrient-rich soil.

There are three main layers of soil. The bedrock layer is the bottom layer, which is about three feet below the surface and has large rocks in it. The subsoil layer is about one foot below the surface. Tree roots and earthworms live here. The topsoil is where the plants grow. This is the layer that must be protected. It is the responsibility of each generation to use the soil wisely. Farmers often have their soil tested to make sure it has the right nutrients. Also, the type of soil a farmer has determines which type of crops can be raised.

Soil is made up of four parts: air, water, minerals, and organic matter. Air and water provide nutrients to the plant so the plant can make food for itself. Organic matter, also known as humus, is made of plant and animal remains in various stages of decay. Minerals are the clay, sand, and silt particles. The mineral content determines the soil type. Sandy soil has mostly sand and no organic matter. Sand is the largest of the soil particles, feels gritty, is the heaviest, and allows water and air to move easily through it. Clay has mostly clay, a little organic matter, and sand. Clay particles are very fine and are the smallest of the three soil particles. Clay is sticky when wet and hard and brick-like when dry. Silt is the soil particle that falls between sand and clay in texture; it is considered a medium-sized soil particle. It feels like flour and is very smooth when you rub in your hands. Silt particles keep the soil rich and loose.

Lesson:

1. Who needs soil?

Ask students to think of ways that animals and plants use the soil.

To live in (termites and worms)

To sleep in (snakes and gophers)

To store food in (squirrels and chipmunks)

To get food from (birds, people and worms)

To hibernate in (turtles, frogs and insects)

To grow in (plants)

Hand out and do "Rabbit" maze

2. What is soil?

Hand out and do "What Is Soil?"

Make edible soil. As the mixture is put into their cups, talk about each layer and relate that to the actual layer of soil

a. Crush and set aside one large package of the cookies.

b. Cream together four tablespoons margarine, one 8-oz.

Pkg. Cream cheese and one cup powdered sugar.

c. Mix together three and one half cups milk, two 3-oz. Pkg. vanilla Instant pudding. Mix well.

d. Bedrock: Begin with a layer of crushed cookies. Then mix chocolate chips with half of the creamed pudding mixture and smooth it over the cookies.

e. Subsoil: Add more crushed cookies, then a creamed pudding layer and gummi Worms. (Save one for the top layer.)

f. Finish with a layer of crushed cookies. Poke a gummi worm through the top to Peek out of your "soil."

3. Which soil is best for crops?

Plant bean seeds in different soil types.

a. For this part you will be using clay soil, sandy soil, and potting soil. As a class you will be planting bean seeds in three different soil types to determine which soil is the best to grow plants. Discuss with students that potting soil is a mixture of all types of soil with some humus added to it.

b. Place some clay soil in one clear, plastic cup. Put some sandy soil in another

and potting soil in the third cup. Label each cup with the types of soil it has in it.
c. Place two bean seeds in each cup. Cover with appropriate soil type.
d. Give each cup a little amount of water. Place each cup next to each other on a window sill.

4. Measure and graph seeds growth.

As a class, measure and graph the growth of the beans.

After one-and-a-half to two weeks, see which plant has grown the most.

Which soil type was the most successful?

Assessment: Questions for understanding

1. What type of soil allows water to run quickly through it?
2. What type of soil is sticky when wet and hard when dry?
3. What is humus or organic matter? How does it benefit soil?
4. Compare and contrast all three types of plant growth.
Which soil was the worst for growing plants?
Which soil was the best?
5. What did the three layers of “Edible Soil” represent?

Resources: A Handful of Dirt by Raymond Bial
Agriculture in Montana Schools Teacher’s Resource Library
National Wildlife Federation
Montana Dirt Babies (Pattern in AMS Treasure Chest)

WHAT IS SOIL?

The earth has many rocks. Sun, wind and water break up and wear away rocks. Growing plants may break up rocks too. Small bits of broken rocks mix with dead plants and animals to make soil. It takes a long time to make just a little bit of soil. That's why it is so important to take good care of it.

Soil needs air and water for plants and animals to live and grow in it.

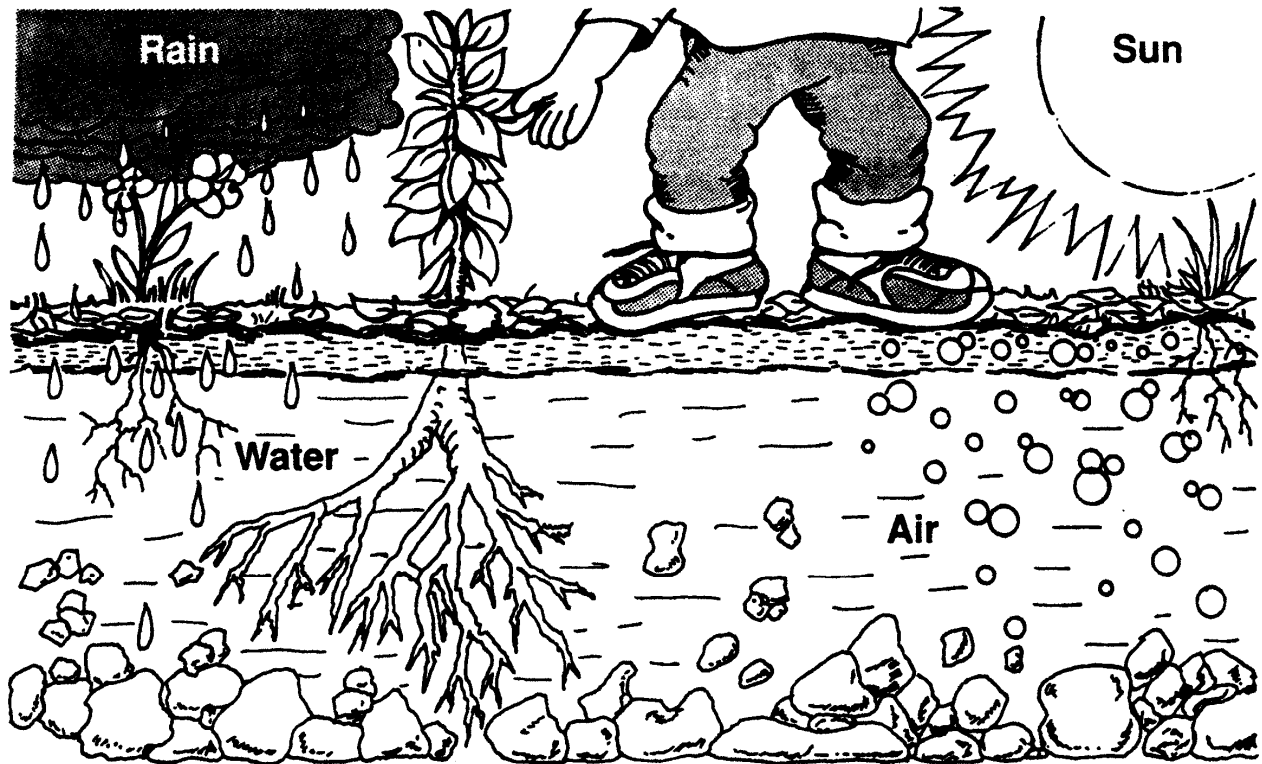
Find these things in this picture:

Roots
Water
Air

Dead plants
and animals
Rocks

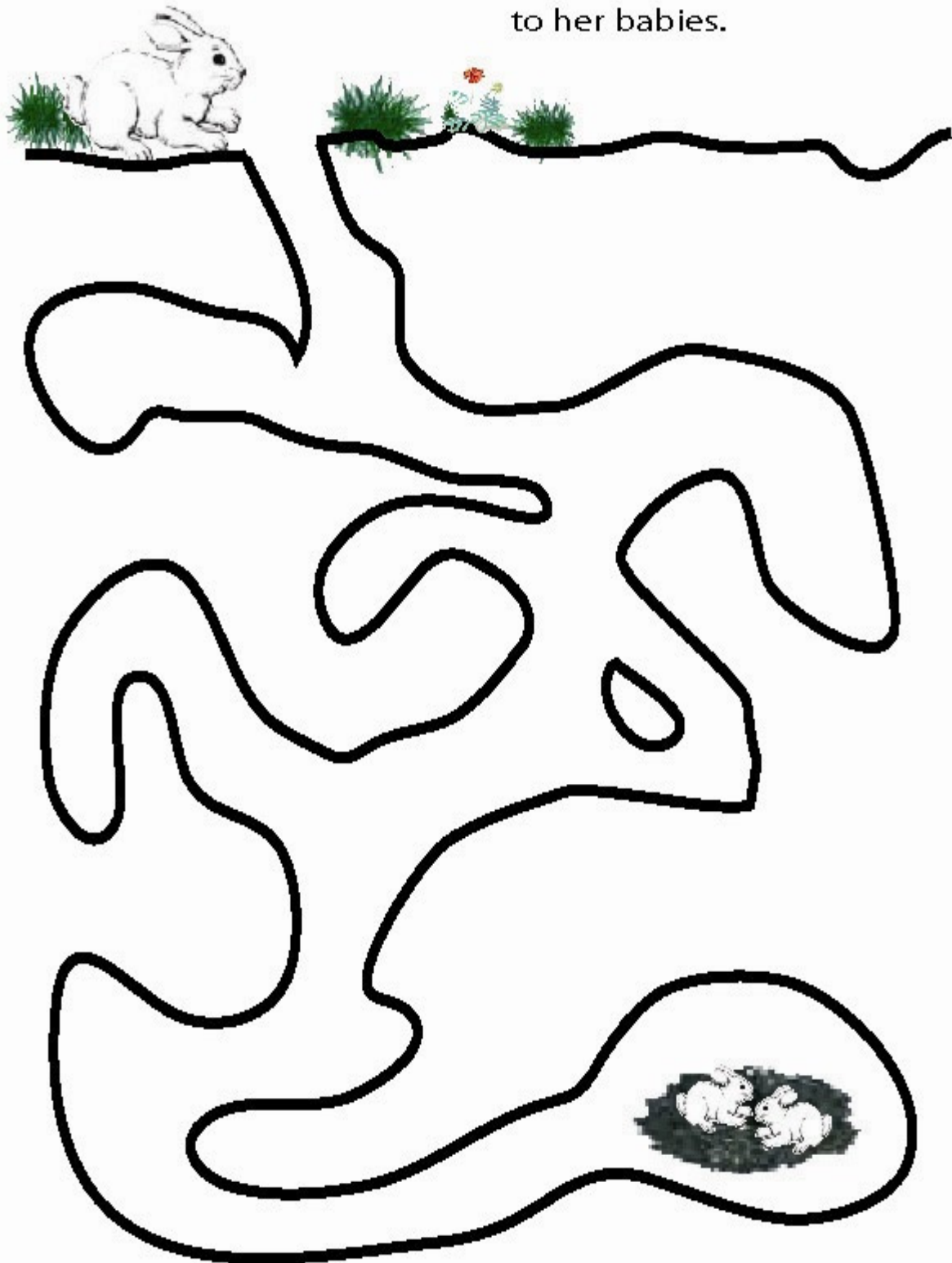
All these things work together to make good soil.

Above the soil



**Help mother
bunny find her
baby bunnies**

This is a rabbit's home.
Draw a line from the mother
to her babies.



IT'S ALL WATER

Grades: Late 1st -2nd

Subjects: Science

Approximate Time: 1 week

Montana Standards: Science 1, 2, and 4

Objectives: Students will

- Be introduced to and develop some understanding of the water cycle.
- Be able to relate the water cycle to everyday life.
- Be exposed to the terminology associated with the water cycle.

Materials Needed:

- Water and Me in the AMS Treasure Chest

Items needed for Activity 1:

- Follow the Raindrop: The Water Cycle in AMS Resource Library
- Kettle
- Water
- Hot Plate
- 8 ½" x 11" piece of cardboard
- Freezer available
- Booklet prepared from sheets numbered 1-5

Items needed for Activity 2:

- Worksheet 6, enlarged by about 20% to fit on 8 ½ x 14 paper
- Butcher Paper
- Transparency of worksheet 6

Items needed for Activity 3:

- Ice cubes
- Spoons
- Two sets of vocabulary cards
- Tape
- Small buckets for each group
- Copies of Worksheet 7, enlarged by about 20% to fit on 8 ½ x 14 paper, with the vocabulary words deleted from the picture.

Keywords:

water cycle, evaporation, condensation, precipitation, collection

Brief Description:

Precipitation, evaporation, and transpiration are all terms that sound familiar, yet may not mean much to you. They are all part of **the water cycle**, a complex process that not only gives us water to drink, fish to eat, but also weather patterns that help grow our crops.

Water is an integral part of life on this planet. It is an odorless, tasteless, substance that covers more than three-fourths of the Earth's surface. Most of the water on Earth, 97% to be exact,

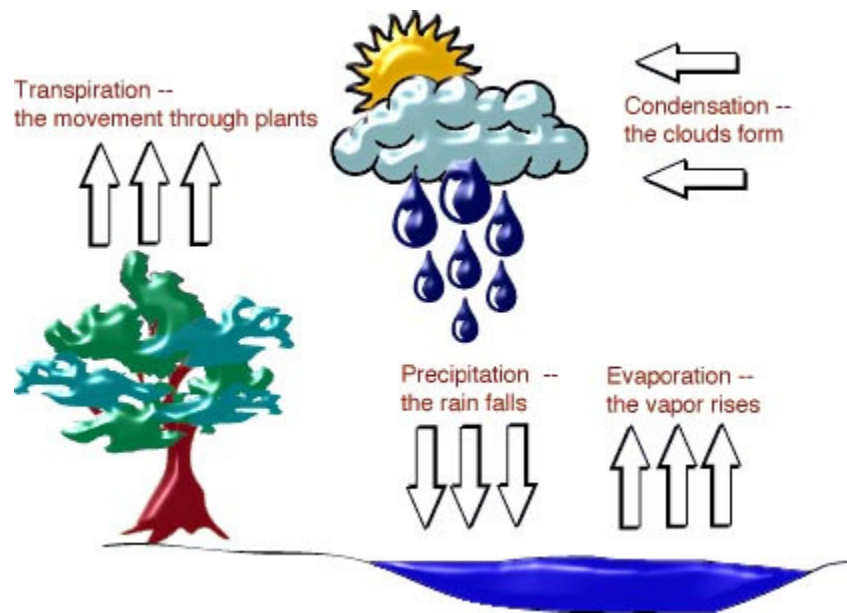
is salt water found in the oceans. We can not drink salt water or use it for crops because of the salt content. We can remove salt from ocean water, but the process is very expensive.

Only about 3% of Earth's water is fresh. Two percent of the Earth's water (about 66% of all fresh water) is in solid form, found in ice caps and glaciers. Because it is frozen and so far away, the fresh water in ice caps is not available for use by people or plants. That leaves about 1% of all the Earth's water in a form useable to humans and land animals. This fresh water is found in lakes, rivers, streams, ponds, and in the ground. (A small amount of water is found as vapor in the atmosphere.)

The Cycle

Water is constantly being cycled between the atmosphere, the ocean and land. This cycling is a very important process that helps sustain life on Earth.

As the water evaporates, vapors rise and condense into clouds. The clouds move over the land, and precipitation falls in the form of rain, ice or snow. The water fills streams and rivers, and eventually flows back into the oceans where evaporation starts the process anew. Learn a lot more about this complicated process in concepts.



Water's state (solid, liquid or gas) is determined mostly by temperature. Although water continuously changes states from solid to liquid to gas, the amount of water on Earth remains constant. There is as much water now as there was hundreds of millions of years ago.

Through activity one the children will observe the water cycle. By the making and coloring of their booklet they will become more familiar with the terminology and understanding of the water cycle.

Through activity two the students will review and discuss the water cycle using worksheet number 6 taken from Water and Me.

Through activity three the children will exhibit their understanding of the water cycle and the terminology associated with the water cycle by participating in the Water Cycle Relay Race.

Lesson 1: Read and discuss the book Follow the Raindrop: The Water Cycle. Be sure to thoroughly discuss the terminology listed in the keywords above. Do the activities on pages 1-5 of the water cycle booklet. Each sheet of the water cycle booklet describes an activity to further explain each step of the water cycle. Teacher should show an overhead of each page of the booklet as they do the activity associated with each step of the cycle. Students and teacher will review the pages of the booklet. They will sequence the pages as a group. Lastly, the pages will be colored by the students. This lesson may be done over several days.

Lesson 2: The teacher will lead a discussion on the water cycle, in the real life situation, as portrayed in the picture of worksheet 6. As children color their individual scene portraying the water cycle, several students will be at a table coloring the large mural of the same scene. This mural will have been previously traced from a transparency by the teacher.

Lesson3: Water Cycle Relay

Lesson:

1. Divide the class into teams. Teacher must supply a picture for each team and a set of vocabulary cards for each team. Show them the Water Cycle, pointing out the missing vocabulary words that describe the steps in the cycle. Explain that they will fill in these blanks with the missing words in the course of a Water Cycle relay Race.
2. Pass out a spoon and ice cubes to each group. As part of the relay, each group will place an ice cube on the spoon and pass both from the back of the line to the front of the line. Let the groups practice passing the spoon with the ice cube on it.
3. Next, give each team a set of the vocabulary words in a bucket. The first person in each line will draw a card from the bucket and attach a piece of tape to it. The first person takes the card to the last person in line; that is holding a spoon with an ice cube. They discuss the vocabulary word and its meaning. The spoon and cube along with the vocabulary card are passed to the next person in line, discussing the word with each student as it is passed to the front of the line. When the vocabulary word and spoon and cube reach the front of the line, that person will carry everything to the poster and tape the vocabulary word in the appropriate space. That same person will then go to the bucket to draw out a new vocabulary word and take it to the last person in line to discuss the vocabulary word before passing the spoon and cube as well as the vocabulary word to the next person in line. And continue on until the picture is filled with the vocabulary words from the bucket. At the end of the race the class will discuss the correctness of the poster as well as which team have the most correct answers and finished first. A good discussion at the end of the race would include what happened to the ice cube during the relay.

Assessment:

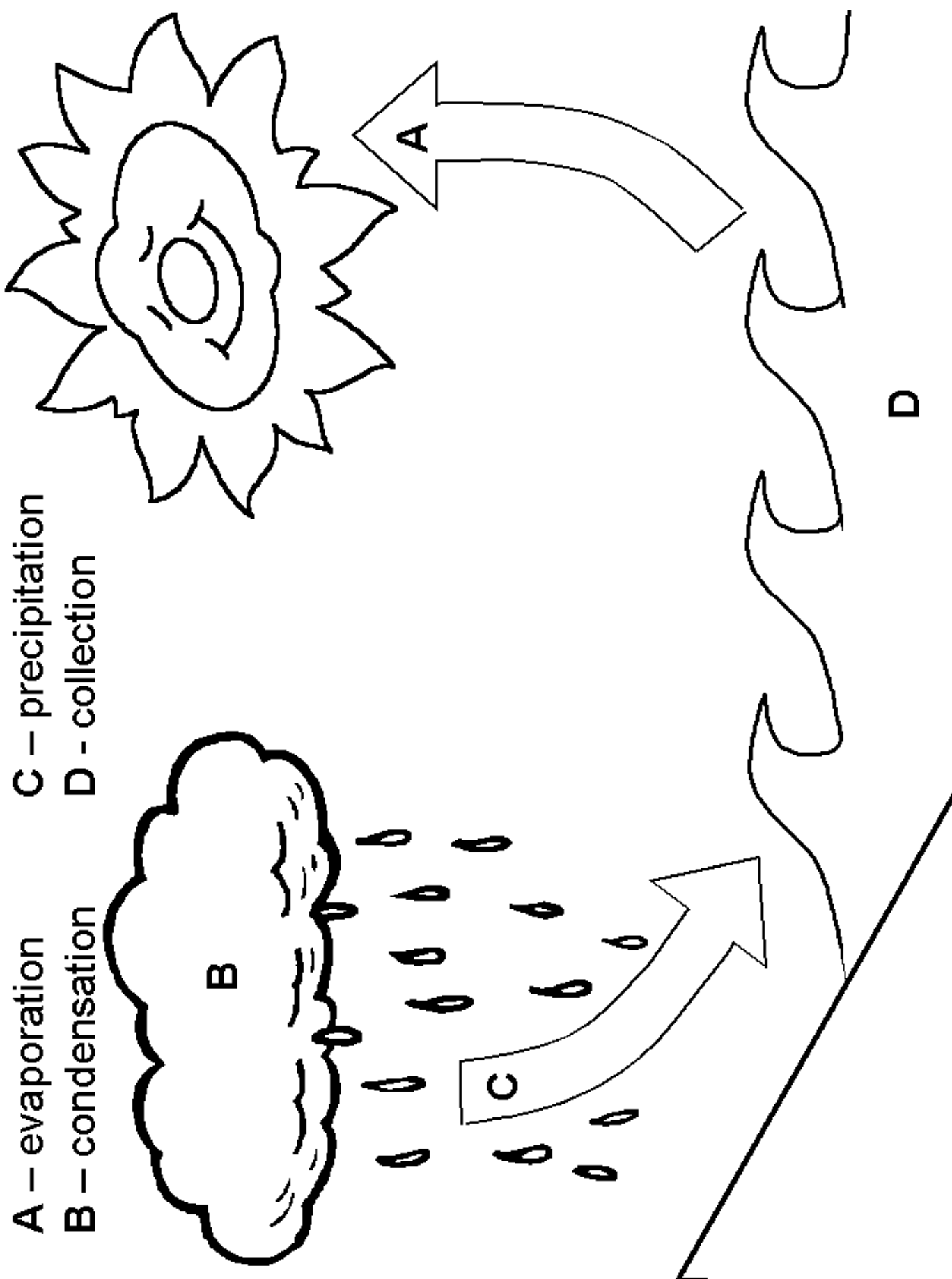
The accuracy of the students when filling out the poster during the Water Cycle Rely Race.

Resources:

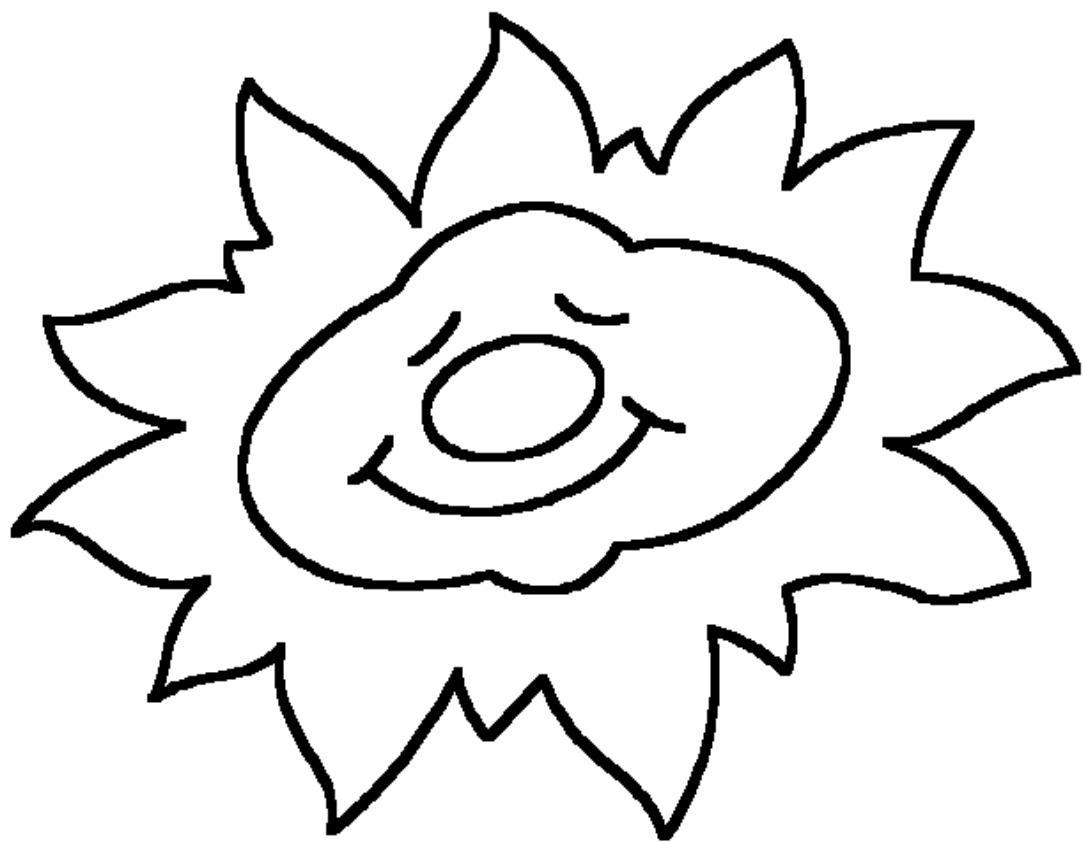
www.enchantedlearning.com/subjects/astronomy/planets/earth/Watercycle.shtml
www.kidzone.ws/water/

Vocabulary Cards for the Relay Race

Water Cycle	Collection
Evaporation	Recreation
Condensation	Plants
Precipitation	Wildlife
Sun	Homes
Clouds	People



Evaporation



Evaporation is when the sun heats up water in rivers or lakes or the ocean and turns it into vapor or steam. The water vapor or steam leaves the river, lake or ocean and goes into the air. Make your own evaporation. With an adult's help, heat some water in a kettle. Watch closely! Do you see the steam rising? That's evaporation!

Condensation



Water vapor in the air gets cold and changes back into liquid, forming clouds. This is called condensation.

To see condensation in action, put a large (at least 8 ½ x 11) piece of cardboard (a book will work) in the freezer for about an hour. Now, take the boiling kettle of water and hold the cold book about 1 foot over the spout (right in the steam... wear oven mitts). Water droplets will form on the book. That's condensation!

Precipitation



Precipitation occurs when so much water has condensed that the air cannot hold it anymore. The clouds get heavy and water falls back to the earth in the form of rain, hail or snow.

If you continue the condensation experiment long enough, so much water will condense on the book that it won't be able to hold it all. At that point, water will start dripping down from the book and you've created precipitation!

Collection



When water falls back to earth as precipitation, it may fall back in the oceans, lakes or rivers or it may end up on land. When it ends up on land, it will either soak into the earth and become part of the “ground water” that plants and animals use to drink or it may run over the soil and collect in the oceans, lakes or rivers where the cycle starts all over again.

SNOW TRANSFORMATION

Grades: Late 2 & 3

Subjects: Science & Math

Approximate Time: 20 minutes

Montana Standards: Science 2,3 & Math 2,5

Objectives: Students will

- Observe and measure the conversion of snow to water.

Materials Needed:

- Clear quart containers with lids
- Rulers
- Rubber bands
- Scale

Keywords:

Prediction, conversion, melt

Brief Description:

This activity is done during a snowfall. All the materials should be kept in containers or plastic bags in the freezer or outdoors at least two hours prior to the actual collection.

Lesson:

1. Ask the students what they think makes up snow. How might they prove it? Explain that they will do a simple experiment to find out this and other important things about snow.
2. Divide the class into pairs. Have the students weigh their empty quart containers and record the weights.
3. Have the students collect the cleanest snow they can find. Weigh the snow-filled containers. Record the weight. Have the students subtract the weight of the empty containers from the weight of the snow-filled container to find the weight of the snow itself.
4. Tape the ruler vertically to the side of the jar. Ask students how high they think the water will be when the snow melts. Have them mark their predictions on the ruler. (For younger students, place rubber bands around the jar instead of the ruler to mark each student's predictions.)
5. Have the students cover the containers, set them aside, and record the time. Ask them to predict how long it will take for all of the snow to melt. Will the melted snow weigh more or less or the same as the unmelted snow? Record predictions.
6. Have the students check the container periodically until all of the snow has melted and record the time.
7. Have the students record the weight and water levels of the melted snow in the containers. Did the weight of the snow change after it melted. (It should be the same.)
8. Have the students compare the results to their predictions. Discuss differences and possible explanations. (The water level of the melted snow will be less than that of the snow because of the volume of the air spaces between the snow crystals.)
9. Have the students share their results.

Resources:

Parrella, Deborah. Project Season. Hands-on activities for discovering the wonders of the world. Shelburne Farms. 1995.

FARMER'S HATS

Grades: K-3

Subjects: Careers

Approximate Time: 30 minutes (may vary)

Montana Standards: Careers 1, 4, 5

Objectives: Students will

- Explain how farmers must “wear many different” hats each day.

Materials Needed:

- Worksheets
- Crayons
- Brass fasteners
- scissors

Keywords:

Veterinarian, engineer, mechanic, manager, conservationist, nutritionist, forester, erosion, pollution, meteorologist, agronomist, diversify

Brief Description:

Farming is an occupation—a way of earning money—that requires the farmer to do many different jobs during a year, and even during a day. In some lines of work, people do the same tasks every day. For occupation, the tasks can be very different from one day to the next, or from one season to the next. Agriculture, or farming, is like that. Farmers must do many different tasks. We call that “wearing a lot of hats”.

Lesson:

1. Photocopy the two worksheet pages for each student. (Don't copy front to back.)
2. Students may chose a male or female and discard the other.
3. Have the students cut out the two larger circles and one of the two farmer circles.
4. Fasten them in the center with a brass fastener.
5. Make sure the largest circle is on the bottom and the smallest is on top.
6. The students should be able to spin all three circles separately. Ask the students to find a hat on the middle circle and put it on the farmer's head, and then try to find the words that best describe what the farmer does when wearing that hat.

Extended Lesson:

Invite agriculturally related speakers to tell students about their jobs and the many “hats” they wear.

Discussion:

1. Why is it important for a farmer to have a basic understanding of all these careers?
2. What other job skills must a farmer use?
3. Do you know people in your community who specialize in any of these career areas?
4. Which of the jobs a farmer does is your favorite? Least favorite?
5. Which jobs are the hardest?
6. What other jobs can you think of require people to wear so many different hats?

Resources:

Alaska Agriculture in the Classroom, through the Alaska Division of Agriculture and the Alaska Farm Bureau.

Adapted from Utah Agriculture in the Classroom

Answer key for hats:

Veterinarian—Must recognize early signs of disease in animals; assist at birth of animals, administer medicine to sick animals; care for wounds and injuries.

Engineer—Must know how to plan and construct fences and buildings; build irrigation ditches and control the flow of water; design animal waste systems.

Mechanic—Must operate and maintain both simple and complicated machinery; make repairs and keep machines in good working order.

Business Manager—Must balance accounts; develop marketing strategy; sell farm produce to the market; make payments and meet payrolls; keep track of equipment, products and land.

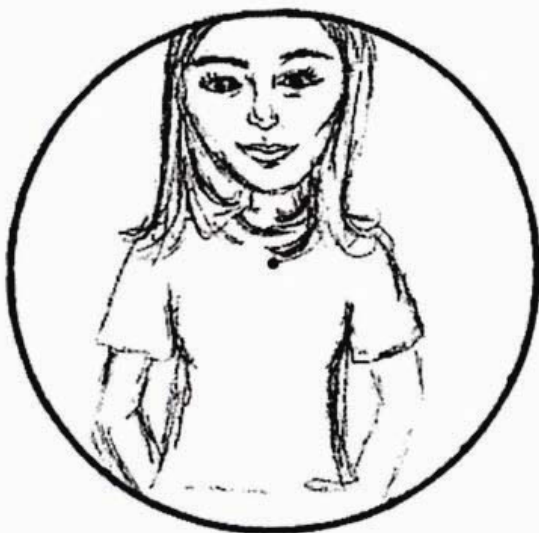
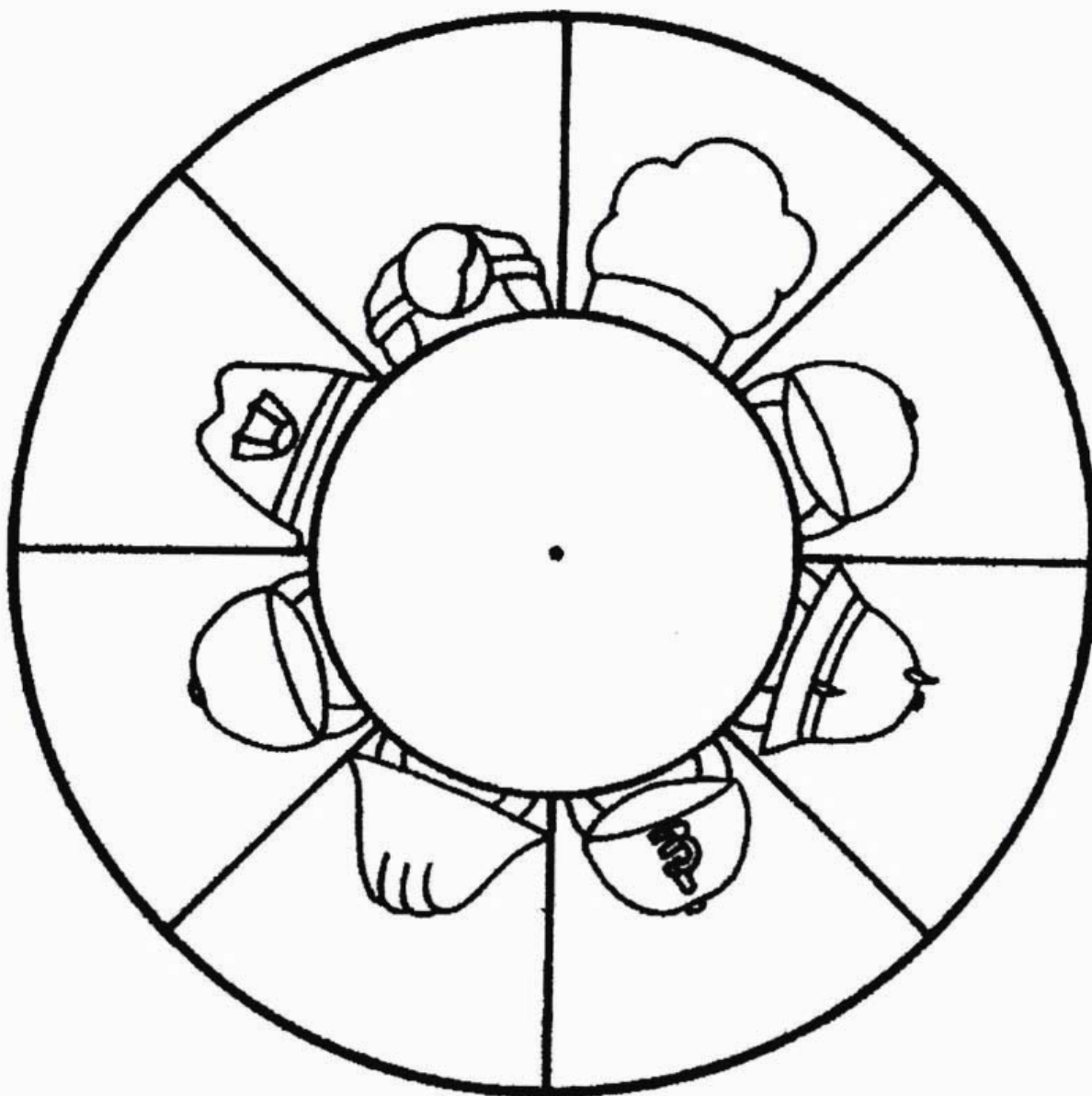
Nutritionist—Must prepare feed rations for best growth and production of livestock.

Resource Conservationist—Must recognize kinds of trees; manage woodlots; detect fires and know the methods for controlling them; prevent soil erosion; protect water quality.

Agronomist—Must understand soil composition and determine the best fertilizer and seed for largest production; the effect of chemicals on animal and plant life.

Meteorologist—Must understand weather and climate; be aware of possible weather changes and how to prepare for these changes.

Many Roles of a Farmer



Many Roles of a Farmer

